

CLAIMS

1. An optoelectronic circuit board comprising:
 - a board having top and bottom surfaces;
 - 5 an optical fiber contained in said board between said top and bottom surfaces;
 - said fiber terminating in a fiber end facet on a side wall of a hole defined in one or both of said surfaces; and
 - an optical emitter or detector mounted on one of said surfaces and electrically connected to electrical conductors on said one of said surfaces; said optical emitter or
 - 10 detector having an optical axis directed into said hole and a reflector supported in said hole for reflecting said optical axis towards said fiber end facet.
2. The circuit board of Claim 1 wherein said optical emitter or detector and said reflector
- 15 are assembled to each other for mounting as an optoelectronic module to said board.
3. The circuit board of Claim 2 wherein said optoelectronic module is mounted to said one of said surfaces and said reflector is suspended in said hole from said one of said
- 20 surfaces.
4. The circuit board of Claim 3 wherein said reflector is configured for reflecting said optical axis generally omnidirectionally about said optical axis.
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5. The circuit board of Claim 4 wherein said reflector is a reflecting surface of revolution about said optical axis.
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6. The circuit board of any of Claims 1 through 4 wherein said reflector and said optical emitter or detector are assembled to a plug body sized and shaped to fit in said hole for positioning said reflector in optical alignment with said fiber facet.

7. The circuit board of Claim 6 wherein said plug body is of light transmitting material and said reflector is an internally reflecting surface of said plug body.

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8. The circuit board of Claim 7 wherein said plug body also defines a lens for condensing light between said reflector and said emitter or detector.

10 9. The circuit board of Claim 1 further comprising a plurality of optical fibers in said board terminating in a plurality of fiber end facets spaced on said side wall, said reflector being arranged and configured for reflecting said optical axis onto all of said fiber end facets.

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10. An optoelectronic module comprising:
an optical device for emitting or detecting a light signal along a first optical path;
an electronic circuit connected for supplying a drive signal to said optical device or for receiving a signal detected by said optical device; and
20 an optical reflector for reflecting said light signal along a second optical path generally transverse to said first optical path;
said optical device, said electronic circuit and said optical reflector being assembled for mounting as a unit to a main circuit board.

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11. The optoelectronic module of Claim 10 wherein said first optical path is directed for entering a hole in said main circuit board in a mounted condition of said assembly and said optical reflector is arranged for directing said second optical path towards a side wall of said hole.

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12. The assembly of Claim 10 further comprising a substrate, said optical device, said electronic circuit and said optical reflector being mounted to said substrate.

13. The optoelectronic module of Claim 1 wherein said optical reflector is a plane reflector.

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14. The optoelectronic module of Claim 10 wherein said optical reflector is a concave reflector.

10 15. The optoelectronic module of Claim 10 wherein said optical reflector is a convex reflector.

15 16. The optoelectronic module of Claim 10 wherein said optical reflector is a conical reflector.

20 17. The optoelectronic module of Claim 10 wherein said optical reflector is a paraboloid of revolution reflector.

18. The optoelectronic module of Claim 10 wherein said optical reflector is a pyramidal reflector.

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19. The optoelectronic module of Claim 10 wherein said optical device comprises one or more light emitters.

30 20. The optoelectronic module of Claim 10 wherein said one or more light emitters comprises one or more laser diodes.

21. The optoelectronic module of Claim 10 wherein said optical device comprises an array of light emitters or light detectors.
- 5 22. The optoelectronic module of Claim 10 wherein said optical device comprises one or more photodiodes.
23. The optoelectronic module of Claim 10 further comprising one or more optical
10 lenses interposed between said optical device and said optical reflector.
24. The optoelectronic module of Claim 23 wherein said one or more optical lenses
15 comprise a convergent lens.
25. The optoelectronic module of Claim 23 wherein said one or more optical lenses
20 comprise a divergent lens.
26. The optoelectronic module of Claim 23 wherein said one or more optical lenses and
said optical reflector are formed as different surfaces of a unitary optical element of light
transmitting material.
- 25 27. The optoelectronic module of Claim 26 wherein said unitary optical element has a
lenticular top surface and an internally reflecting bottom surface.
- 30 28. The optoelectronic module of Claim 12 wherein said substrate comprises a printed
circuit interconnecting said electronic circuit and said optical device.

29. The optoelectronic module of Claim 12 further comprising electrical contacts on said substrate for mounting and interconnecting said optoelectronic module to a main circuit board.

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30. The optoelectronic module of Claim 29 wherein said electrical contacts are on an underside of said substrate.

10 32. The optoelectronic module of Claim 30 wherein said electrical contacts are adapted for surface mounting said assembly to the said main circuit board.

15 33. The optoelectronic module of Claim 12 wherein said electronic circuits are mounted to a top of said substrate.

20 34. The optoelectronic module of Claim 12 wherein said substrate is a circuit board and said first optical axis is substantially perpendicular to said circuit board.

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35. An optoelectronic module comprising:

a substrate;

an optical device for emitting or detecting a light signal along a first optical path;

25 an electronic circuit connected for supplying a drive signal to said optical device or for receiving a signal detected by said optical device; and

an optical reflector for reflecting said light signal along a second optical path generally transverse to said first optical path;

30 said optical device, said electronic circuit, said optical reflector and said contacts being assembled to said substrate for mounting said assembly to a main circuit board such that said first optical path is perpendicular to said main circuit board in a mounted condition of said assembly.

36. A method of making an optoelectronic circuit board comprising the steps of:
embedding an optical fiber between said top and bottom surfaces of a board; and
making a hole in said board and through said optical fiber so as to cut the optical
5 fiber into segment each terminating in a fiber end facet on a side wall of said hole.

37. The method of Claim 36 further comprising the steps of:
mounting an optical emitter or detector to said board with an optical axis directed
10 into said hole and supporting a reflector in said hole for reflecting said optical axis
towards said fiber end facet.